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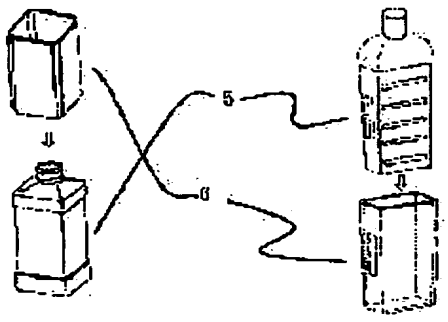
(54) BIODEGRADABLE COMPOSITE CONTAINER AND MANUFACTURE THEREOF

(57)Abstract:

PURPOSE: To save a resin to be used without losing its strength and physical properties of a container by combining a draw-blown container made of biodegradable plastic and paper.

CONSTITUTION: Polylactic acid and fatty acid ester which are highly suitable for draw-blow molding is preferably used as biodegradable plastic and molded by draw-blowing. At this time, paper is preferably inserted into a metallic mold in advance and draw-blow molded. Paper 6 to be combined with a draw-blow molded container 5 is a precursor of a container which has been shaped in advance, while a pattern or characters may be printed on a surface and used as a label. Thus an amount of the biodegradable plastic to be used can be reduced as well as no problem occurs in strength, whereby an entire container which is made unnecessary can be biodegraded.



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CLAIMS

[Claim(s)]
[Claim 1] The biodegradability compound container characterized by having covered partially or extensively at least the extension blow container which consists of a biodegradable plastic in paper.
[Claim 2] The biodegradability compound container according to claim 1 characterized by said paper being a label.
[Claim 3] The biodegradability compound container according to claim 1 characterized by being the container precursor with which size enlargement of said paper was carried out beforehand.
[Claim 4] The biodegradability compound container according to claim 1 to 3 characterized by said biodegradable plastic being polylactic acid or aliphatic series polyester.
[Claim 5] The manufacture approach of the biodegradability compound container which is the manufacture approach of the biodegradability compound container characterized by having covered partially or extensively at least the extension blow container which consists of a biodegradable plastic in paper, and is characterized by inserting said paper beforehand in the metal mold in the case of a biodegradable plastic extension blow, and carrying out extension blow molding.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Industrial Application] This invention relates to the biodegradability plastic envelope which can be disassembled by burying in soil, attaching to the sanitary sewage, etc., and its manufacture approach.

[0002]
[Description of the Prior Art] Biodegradable plastics, such as polylactic acid, aliphatic series polyester, hydroxy polyester, and poly KAPUTO lactone, are known as resin biodegraded by hydrolysis and the microorganism, if it performs burying in soil, attaching to the sanitary sewage, etc.
[0003] however, the catalyst which is that by which the polymerization as which the polymerization method is not solved twists this resin to a microorganism is expensive -- etc. -- a problem is in economical efficiency from a reason.
[0004] Since it is such, the device which reduces the amount of use resin at the time of using and fabricating this resin is made. However, in order to fabricate as a container, if there is a limitation from the side of mold goods on the strength, physical properties, etc., for example, it is filled up with contents, problems, like that a container blisters and buckling strength becomes weak will arise.
[0005] On the other hand, as an approach of streamlining plastics conventionally, it streamlines, thickness becomes thin and the approach of covering in paper etc. the plastic envelope which has a problem in reinforcement, and carrying out on-the-strength maintenance is learned. However, the container of this approach often poses a problem by the approach of processing, in order that plastics may not perform decomposition etc. and the volume may not decrease, even if it performs burying in soil etc. when it changes with needlessness.
[0006]
[Problem(s) to be Solved by the Invention] The place which it is made in order that this invention may solve these troubles, and is made into the technical problem is to offer the biodegradability compound container to which biodegradation of the whole container which there was little amount of the biodegradable plastic used, and a target (drum bulging when being filled up especially with contents) on the strength moreover did not have a problem, and became unnecessary can be carried out, and its manufacture approach.
[0007]
[Means for Solving the Problem] This invention offers the biodegradability compound container characterized by having covered partially or extensively at least the extension blow container which consists of a biodegradable plastic in paper in order to solve this technical problem. Moreover, the biodegradability compound container characterized by that papers are a label and the container precursor by which size enlargement was carried out beforehand, and said biodegradable plastic being polylactic acid or aliphatic series polyester is offered. Moreover, the manufacture approach of the biodegradability compound container characterized by inserting said paper beforehand in the metal mold in the case of a biodegradable plastic extension blow, and carrying out extension blow molding is offered.
[0008] The detail of this invention is explained below. As a biodegradable plastic used for this invention, the high polylactic acid of extension blow molding fitness and aliphatic series polyester

are used preferably that what is necessary is just thermoplastic biodegradable plastics, such as polylactic acid, aliphatic series polyester, hydroxy polyester, and poly KAPUTO lactone.
[0009] As polylactic acid, the polylactic acid or the polylactic acid of a copolymer with a tartaric acid, a glycolic acid, alpha-malic acid, a polyethylene glycol, lactone, etc. of a simple substance is sufficient.
[0010] As aliphatic series polyester, it is good with the aliphatic series polyester by which a polycondensation is carried out to dicarboxylic acid, such as an adipic acid, succinic acid, and oxalic acid, from glycols, such as ethylene glycol, propylene glycol, and butanediol.
[0011] Extension blow molding is used as the shaping approach of these biodegradability resin. Extension blow molding is the main description of this invention, and since it can raise the reinforcement of a container and can make thickness thin by extending a biodegradable plastic, it can reduce the amount of use resin of a biodegradable plastic.
[0012] The conceptual diagram of the extension blow molding of a biodegradable plastic is shown in drawing 1 . Preforming consists of the flange (2) and preforming drum section closed-end body (3) which play the role of the screw section (1) and the preforming support at the time of extension shaping.
[0013] In addition, shaping of a biodegradable plastic is possible also in the cold-parison method which divides a preforming shaping stroke and an extension blow molding stroke, and is held by about two lines as the extension blow molding approach, or the hot parison method which performs a preforming forming cycle and an extension blow molding process at a series of processes.
[0014] The paper to combine may print a pattern, a character, etc. on a front face, and may use them for it as a label. Even if it does not cover the whole container, as shown in drawing 3 , the improvement in on the strength can desire a part of a biodegradability plastic envelope weak in reinforcement at least for a wrap. As the compound approach with paper, how to cover an extension blow container in the paper after shaping and two kinds of approaches of inserting paper at the time of shaping of an extension blow container can be considered.
[0015]
[Function] Container reinforcement becomes weak although the thick thinner one with the point of the resolvability when becoming unnecessary and economical efficiency to amounts [few] of use resin of the thickness of the extension blow molding container of a biodegradable plastic is desirable. In this invention, in order to maintain this container reinforcement, paper amends. Although the conceptual diagram of the compound container of an extension blow container and paper is shown in drawing 2 , the compound container of this invention is limited to these, and the foil and various gestalten are possible.
[0016]
[Example]
Injection molding of glass transition point temperature =56.8 degree C, crystallization temperature =107.8 degree C, melting point =160.3 degree C, and the 15g of the polylactic acid which consists of weight average molecular weight / number-average-molecular-weight (Mw/Mn) =2.4 was carried out as <example 1> biodegradability tree plastics with the cylinder temperature of 200 degrees C, and the die temperature of 15 degrees C, and 2.2mm in a flange with a diameter of 30mm, a drum section with a diameter of 27.4mm, die length of 120mm, and thickness and 15g preforming (closed-end parison) were obtained.
[0017] Reheat this preforming, consider as 94 degrees C (reheating temperature), cool slowly, and preforming temperature is made into 75 degrees C (extension temperature) at homogeneity. Extension rod pressure; Extension blow molding is carried out in secondary blow;15 kgf/cm2 and 3s for 7 kgf/cm2, primary blow;3.3 kgf/cm2, and 1s. The 1000ml extension blow container made from polylactic acid with 2.1 times as many vertical draw magnification as this, the horizontal draw magnification of 2.6 times, a bottle height [of 250mm], and a diameter of 78mm was obtained. Thus, the obtained container of the appearance was transparent and became a thing with a thickness of 0.2mm. Preforming was also transparent.
[0018] As shown in drawing 2 (1), the obtained extension blow container made from polylactic acid was put into the box made of paper, and was used as the compound container. The result of having measured the buckling strength of this container and shatter strength is shown in Table 1. Although

this container became what does not have configuration maintenance capacity severely [a fall on the strength] when this container was buried for six months in soil, as for this container left for six months in air, an appearance etc. did not change.

[0019] When fabricating the extension blow container made from the polylactic acid of the <example 2> example 1, the compound container with bottle height of 250mm as beforehand inserted the box made of paper in metal mold, performed extension blow molding at the process of extension blow molding and shown in drawing 2 (2), a diameter [of 78mm], and a capacity of 900ml was obtained. The thickness of the extension blow bottle made from the polylactic acid of a compound container was 0.2mm. The result of having measured the buckling strength of this container and shatter strength is shown in Table 1. Although this container became what does not have configuration maintenance capacity severely [a fall on the strength] when this container was buried for six months in soil, as for this container left for six months in air, an appearance etc. did not change.

[0020] Injection molding of difference =30.4 degree C (melting out temperature =93.8 degree C, recrystallization temperature = 63.4 degrees C) of weight average molecular weight / number-average-molecular-weight =3, a melting out temperature, and recrystallization temperature and the aliphatic series polyester 10g which consists of heat-of-fusion =35.9J/g dicarboxylic acid and a glycol was carried out as a <example 3> biodegradable plastic, and preforming (closed-end parison) with 2.0mm [in a flange of with a diameter of 30mm, a drum section with a diameter of 28mm, die length of 100mm, and thickness] and a weight of 10g was obtained.

[0021] Reheat this preforming, consider as 94 degrees C (reheating temperature), cool slowly, and preforming temperature is made into 70 degrees C (extension temperature) at homogeneity. Extension rod pressure; Extension blow molding is carried out in secondary blow;30 kgf/cm2 and 5s for 7 kgf/cm2, primary blow;3.3 kgf/cm2, and 2s. The 350ml extension blow container made from aliphatic series polyester with 1.4 times as many vertical draw magnification as this, the horizontal draw magnification of 2.2 times, a bottle height [of 140mm], and a diameter of 62mm was obtained. The thickness of the obtained extension blow container made from aliphatic series polyester was a 0.3mm container.

[0022] The compound container which puts in this extension blow container made from aliphatic series polyester into carton, and is shown in drawing 2 (3) was obtained. The result of having measured the buckling strength of this container and shatter strength is shown in Table 1. Although this container became what does not have configuration maintenance capacity severely [a fall on the strength] when this container was buried for six months in soil, as for this container left for six months in air, an appearance etc. did not change.

[0023] The extension blow container made from polylactic acid fabricated in the <example 1 of comparison> example 1 is not put into the box made of paper, but the result of having performed measurement of buckling strength and shatter strength is shown in Table 1. Compared with the compound container of an example 1, it was a container with weak buckling strength and shatter strength.

[0024] The container for obtaining the same buckling strength and shatter strength by the shape of an extension blow container and isomorphism made from polylactic acid fabricated in the <example 2 of comparison> example 1 was obtained in direct blow molding. This container was put in in the box made of paper like the example 1, and the compound container of the shape of an example 1 and isomorphism was obtained. Compared with the compound container of an example 1, the amount of the used biodegradable plastic is 20g, and were needed no less than 5g compared with the example 1. [many]

[0025] Instead of the polylactic acid of the <example 3 of comparison> example 1, polyethylene terephthalate 16g was used and the same compound container as an example 1 was obtained. When this container was buried in soil, even if ****** made surrounding paper BOROBORO for one year in six months, the fall of the extension blow container made from polyethylene terephthalate on the strength was not seen. A result is summarized in Table 1 above.

[0026]

[Table 1]

	紙複合	成形方法	使用樹脂	座屈	落下	樹脂量	分解
実施例1	有り	延伸ブロー	ポリ乳酸	23	○	15g	○
実施例2	有り	延伸ブロー	ポリ乳酸	25	○	15g	○
実施例3	有り	延伸ブロー	脂肪族ポリエステル	18	○	10g	○
比較例1	なし	延伸ブロー	ポリ乳酸	4	×	15g	○
比較例2	有り	ダイレクトブロー	ポリ乳酸	23	○	20g	○
比較例3	有り	延伸ブロー	PET	21	○	16g	×

座屈：クロスヘッドスピード20mm/minテンシロンにて測定した強度(kgf/cm²)

落下：5℃24時間保存後コンクリート上1mから10回落下　強度判定
○…割れなし　×…割れ発生
分解：土中6カ月間保存による分解性

[0027]
[Effect of the Invention] As explained to the detail above, by the biodegradability compound container which combined the extension blow container which used the biodegradable plastic, and paper, and its manufacture approach, container reinforcement and physical properties could not be spoiled, but the amount of use resin of a biodegradable plastic could be reduced, and it became possible to solve an economical problem and a reinforcement-problem.
[0028]

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the conceptual diagram of extension blow molding.
[Drawing 2] It is the explanatory view showing the configuration of one example of a biodegradability compound container.
[Drawing 3] It is the explanatory view showing the configuration of one example of a biodegradability compound container.
[Drawing 4] It is the explanatory view showing the configuration of the cross section of one example of a biodegradability compound container.
[Description of Notations]
1 -- Screw section 2 -- Flange 3 -- Drum section closed-end body 4 -- Extension rod
5 -- Biodegradability extension blow container 6 -- Paper 7 -- Biodegradability compound container

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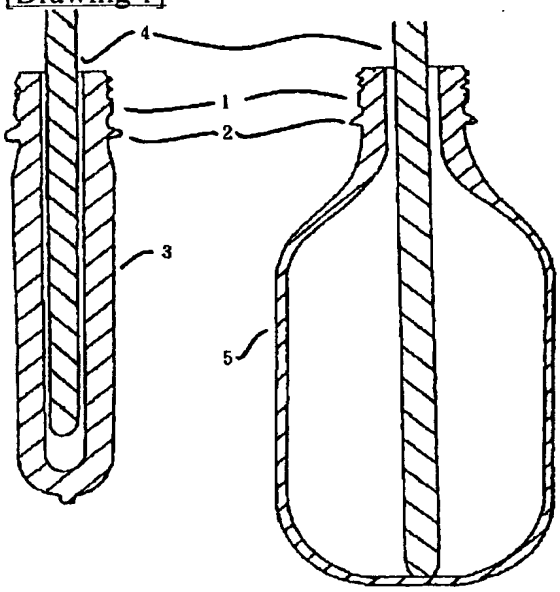
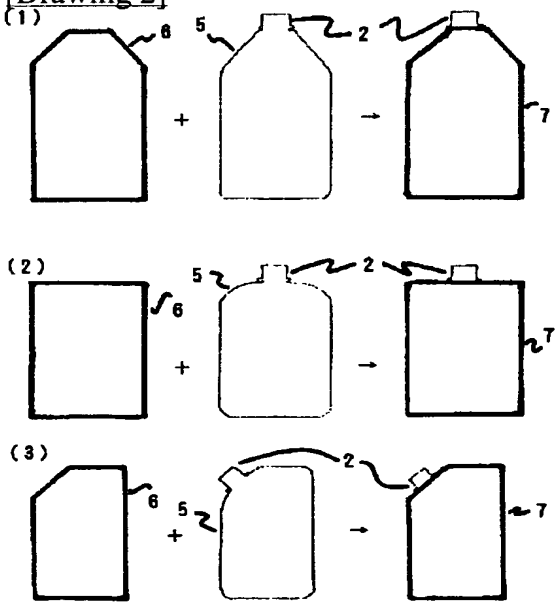
DRAWINGS

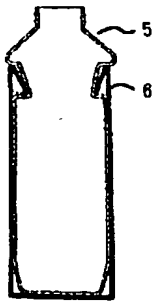
[Drawing 1]



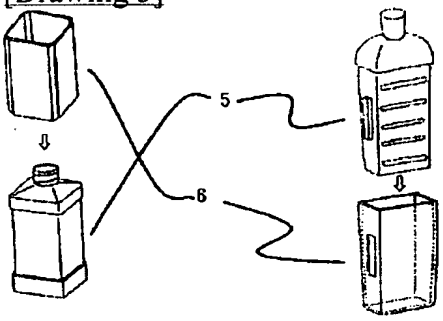
[Drawing 2]



[Drawing 4]



[Drawing 3]



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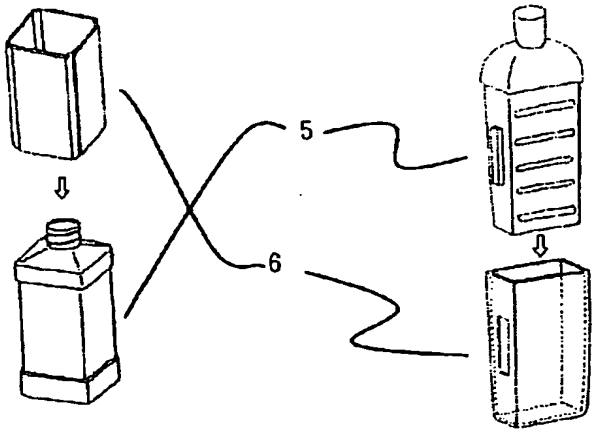
(54)【発明の名称】　生分解性複合容器及びその製造方法

(57)【要約】

【目的】生分解性プラスチックの使用量が少なく、しかも強度的（特に内容物を充填した時の胴膨れ）に問題がなく、不要になった容器全体を生分解させることができる生分解性複合容器を提供することにある。

【構成】生分解性プラスチックから成る延伸ブロー容器を、少なくとも部分的に或いは全面的に、紙で覆っていることを特徴とする生分解性複合容器を提供する。また、紙がラベル、予め賦形された容器前駆体であること、前記生分解性プラスチックがポリ乳酸あるいは脂肪族ポリエステルであること、前記紙が延伸ブロー成形の際の金型内に予めインサートされて成形されることを特徴とする。



をインサートする2通りの方法が考えられる。

【0015】

【作用】生分解性プラスチックの延伸ブロー成形容器の肉厚は、不要になった時の分解性、経済性の点から、使用樹脂量の少ない、肉厚の薄い方が好ましいが容器強度が弱くなる。本発明ではこの容器強度を保つ為に、紙によって補正する。延伸ブロー容器と紙との複合容器の概念図を図2に示すが、本発明の複合容器をこれらに限定するものではく、様々な形態が可能である。

【0016】

【実施例】

＜実施例1＞生分解性樹プラスチックとしてガラス転移点温度＝56．8℃、結晶化温度＝107．8℃、融点＝160．3℃、重量平均分子量／数平均分子量（Mw／Mn）＝2．4からなるポリ乳酸15gをシリンダ温度200℃、金型温度15℃で射出成形し、直径30mmのフランジ部、直径27．4mmの胴部、長さ120mm、厚さ2．2mm、15gのプリフォーム（有底パリソン）を得た。

【0017】該プリフォームを再加熱し94℃（再加熱温度）とし、徐冷してプリフォーム温度を均一に75℃（延伸温度）とし、延伸ロッド圧力；7kgf／cm²、一次ブロー；3．3kgf／cm²、1s、二次ブロー；15kgf／cm²、3sにて延伸ブロー成形して、縦延伸倍率2．1倍、横延伸倍率2．6倍、ボトル高さ250mm、直径78mmの1000ml のポリ乳酸製延伸ブロー容器を得た。このようにして得た容器は、外観は透明で、肉厚0．2mmのものとなった。プリフォームも透明であった。

【0018】得られたポリ乳酸製延伸ブロー容器を、図2（1）に示す様に紙製の箱に入れて複合容器とした。該容器の座屈強度、落下強度を測定した結果を表1に示す。該容器を土中に6ヶ月間埋めたところ、該容器は強度低下が厳しく形状保持能力のないものとなったが、空気中に6ヶ月間放置した該容器は外観等変化しなかった。

【0019】＜実施例2＞実施例1のポリ乳酸製の延伸ブロー容器を成形する際、延伸ブロー成形の工程で、予め金型内に紙製の箱をインサートし、延伸ブロー成形を行い図2（2）に示す様なボトル高さ250mm、直径78mm、容量900ml の複合容器を得た。複合容器のポリ乳酸製の延伸ブローボトルの肉厚は0．2mmであった。該容器の座屈強度、落下強度を測定した結果を表1に示す。該容器を土中に6ヶ月間埋めたところ、該容器は強度低下が厳しく形状保持能力のないものとなったが、空気中に6ヶ月間放置した該容器は、外観等変化しなかった。

【0020】＜実施例3＞生分解性プラスチックとして重量平均分子量／数平均分子量＝3、融解温度と再結晶化温度の差＝30．4℃（融解温度＝93．8℃、再結晶化温度＝63．4℃）、融解熱＝35．9J／gのジカルボン酸とグリコールからなる脂肪族ポリエステル10gを射出成形し、直径30mmのフランジ部、直径28mmの胴部、長さ100mm、厚さ2．0mm、重量10gのプリフォーム（有底パリソン）を得た。

【0021】該プリフォームを再加熱し94℃（再加熱温度）とし、徐冷してプリフォーム温度を均一に70℃（延伸温度）とし、延伸ロッド圧力；7kgf／cm²、一次ブロー；3．3kgf／cm²、2s、二次ブロー；30kgf／cm²、5sにて延伸ブロー成形して、縦延伸倍率1．4倍、横延伸倍率2．2倍、ボトル高さ140mm、直径62mmの350ml の脂肪族ポリエステル製延伸ブロー容器を得た。得られた脂肪族ポリエステル製延伸ブロー容器の肉厚は0．3mmの容器であった。

【0022】該脂肪族ポリエステル製延伸ブロー容器をカートンの中に入れて図2（3）に示す複合容器を得た。該容器の座屈強度、落下強度を測定した結果を表1に示す。該容器を土中に6ヶ月間埋めたところ、該容器は強度低下が厳しく形状保持能力のないものとなったが、空気中に6ヶ月間放置した該容器は、外観等変化しなかった。

【0023】＜比較例1＞実施例1で成形したポリ乳酸製の延伸ブロー容器を、紙製の箱に入れず、座屈強度、落下強度の測定を行った結果を表1に示す。実施例1の複合容器に比べ、座屈強度、落下強度共、弱い容器であった。

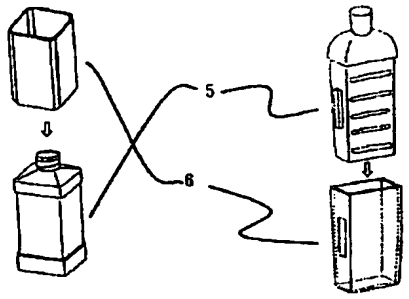
【0024】＜比較例2＞実施例1で成形したポリ乳酸製の延伸ブロー容器と同形状で同様の座屈強度、落下強度を得るための容器をダイレクトブロー成形にて得た。該容器を実施例1と同様に紙製の箱内に入れ、実施例1と同形状の複合容器を得た。実施例1の複合容器に比べ、使用した生分解性プラスチックの量は、20gであり、実施例1に比べ5gも多く必要とした。

【0025】＜比較例3＞実施例1のポリ乳酸の代わりに、ポリエチレンテレフタレート16gを使用し、実施例1と同様の複合容器を得た。該容器を土中に埋めたところ、周囲の紙は6カ月間でボロボロになたっが、1年間してもポリエチレンテレフタレート製の延伸ブロー容器の強度低下はみられなかった。以上結果を表1にまとめる。

【0026】

【表1】

【図３】



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